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SYSTEMATIC POSITION OF MELOSIRA AMBIGUA (GRUN.) O. MULL. AND ITS NEW FORM

[O. sistematicheskom polozhenii Melosira ambigua (Grun.) O. Mull. i yeye novoy formy]

by

A. P. Skabichevskiy

Published in Novosti sistematiki nizshikh rasteniy [advances in the Systematics of the Lower Plants], Moscow, Nauka Publishing House, 1966, pp 46-51.

The systematic position of the diatom alga Melosira ambigua has thus far not received universal acceptance. In its features it is close to M. italica (Ehr.) Kutz. and several authors consider it as a form subordinate to the latter. Grunov (1881), the first to observe the organism, held it to be a variety of the above-described M. italica, but Muller (1903), and after him Hustedt (1927) believed it more correct to consider it as an independent species. The same point of view is maintained by V. S. Poretskiy (1951:732). In opposition to this view, Cleve-Euler (1951:26) does not consider M. ambigua to be a distinct species, but includes it among the form of M. italica.

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Insisting on the independence of M. ambigua as a distinct species, Hustedt (1930:257) writes that M. ambigua by the nature of its annular groove cannot be approximated with other species. The annular groove in M. ambigua has the shape of a broad groove with a rounded bottom (U-shaped in cross section) and never occurs as an acute-angled narrow groove (V-shaped in cross section).

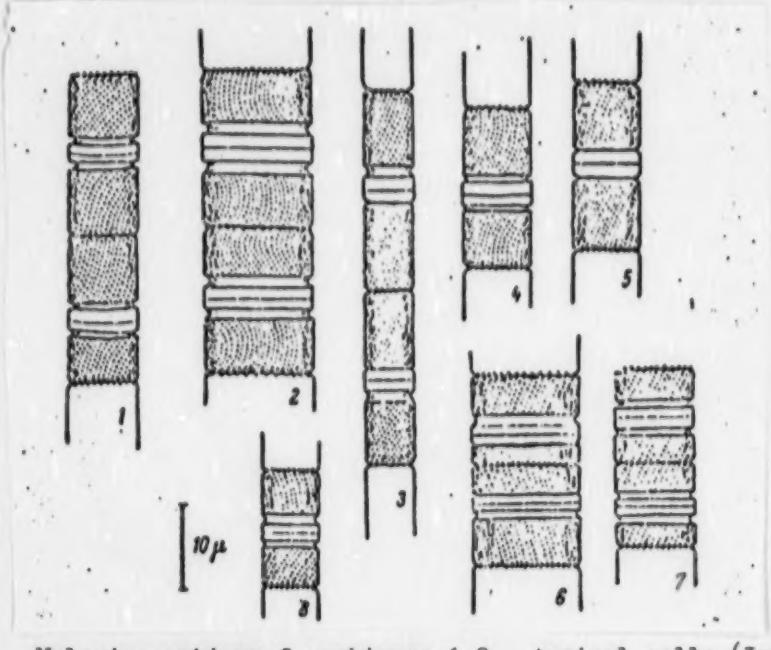
My observations on M. ambigua convinced me that Hustedt was not entirely correct. I was able to observe the species in large numbers in the plankton of the Irtysh River, Lake Zaysan, several lakes in Omskaya Oblast, the Verkh-Isetskiy Pond in the Urals (from the materials of S. N. Ulomskiy), the Dunay River (from the materials of Ya. V. Roll) and so on. I established that among the vast majority of M. ambigua cells with the typical, more or less deep annular groove, cells were encountered in which the groove did have an acute-angled form resembling that of M. italica. Further study showed that these "italica"-shaped cells were juvenile. In favor of this is the nature of the cases of these cells, a smaller thickness, and the more delicate pore structure. Cells were found in which one half of the cases (one valve) was coarser and had the groove typical of M. ambigua, while the other half was thinner, with a delicate pore structure and with an acute-angled, "italica"-shaped groove. These asymmetric cells lay in pairs (see figure, 3) in a small chain of normal cells. Obviously, they were formed due to the division of one parental cell, from which they obtained one typical, coarser valve, while the others, with the delicate valves with acute-angled annular groove, formed by themselves. Sometimes the filaments of M. ambigua were found to include cells in which both valves were juvenile, with acute-angled annular

grooves (see figure, 5), and less often intact sections of filaments were composed of these unformed juvenile cells. Finally, we can see cells in which the annular groove has an intermediate form between M. ambigua and M. italica (see figure, 4).

These data allow us to conclude that the M. ambigua valves were formed not at once with all their features, and that in the course of development they passed through the "italica"-like stage, that is, had an acute-angled annular groove, which later gradually took on the form of a broad groove with a rounded bottom, characteristic of M. ambigua. The process of groove formation occurred evidently rapidly, therefore the cells with undeveloped acute-angled annular groove are encountered relatively infrequently. Nonetheless, the presence in the M. ambigua population of the "italica"-like cells is a common phenomenon, and it can serve as the course of the errors in the determination of the species. Thus, Ye. Nel'zina and L. Maslennikova (1938: 79, 85) indicate for Lake Zaysan both M. ambigua and M. italica, but many have never detected M. italica in the Irtysh River plankton in numerous investigations; and I have not found it upon visiting Lake Zaysan in the summer of 1955. This enables me to maintain that M. italica is not to be found in the Zaysan-Irtysh system. It is highly possible that other forms classified by Cleve-Oiler as M. distans (Ehr.) Kutz. (Cleve-Euler, 1951: 22, Figure 11, i, k, f, and so on) are incompletely formed M. ambigua cells.

To evaluate the significance of the shape of the annular groove as a distinguishing feature of M. ambigua, it was important to find what the situation is with the variability of its form in the case of M. italica. Thanks to the kindness of K. A. Gusevoy I was able to investigate M. italica

from the Rybinskoye Reservoir. In addition, I had M. italica specimens from Lake Shchuch'ye (Borovskaya group of lakes in Kokchetavskaya Oblast). Study of the M. italica frustules showed that the shape of the annular groove in this latter species gives no transitions to M. ambigua. The annular groove of M. italica can be more or less deep, but it always is acute-angled and never has the shape of a broad groove with a rounded bottom.



1-5. Melosira ambigua f. ambigua: 1,2. typical cells (Irtysh River). 3. two asymmetric cells in which one valve (upper and lower) is old, with typical annular groove and coarser structure, the second (both middle) is juvenile, with acute-angled annular groove and more delicate pore structure. 4. cell with forming annular grooves, bearing intermediate character. 5. cell with two young valves and acute-angled "italica"-like annular groove. 6-8. M. ambigua f. altaica.

It must be stated that the gradualness of the formation of the valves, in particular the annular groove, is a phenomenon that evidently is characteristic also of other species of Melosira. At least for the case of juvenile valves of M. italica, M. granulata (Ehr.) Ralfs and M. islandica O. Mull. the annular grooves are always less defined than for the adult individuals. Of major interest in this respect is the extremely infrequent diatom M. distans var. pfaffiana (Reinsch) Grun., characterized by a very poorly defined, nearly leveled annular groove, that is, by a feature that is not characteristic of the species. Possibly, it is only a stage in the development of one of the M. distans forms, just as M. cataractarum Hust.

The foregoing on the "italica"-like developmental stage of M. ambigua are by no means indicative of the subordinate position of the species. More properly the reverse is true: this fact even more firmly consolidates the position of the advocates of the independence of the M. ambigua species, since it convinces us that in the formed cell the annular groove always has the shape of a broad groove with a rounded bottom. In addition, there are other morphological characteristics of M. ambigua, although less significant: the pointwise structure of the lateral surface of the "pallium" valve, according to V. S. Poretskiy (1951) is more abrupt and well defined in M. ambigua than in M. italica, and in the latter the height of the valve in the diameter of the cells are somewhat greater than in the former.

Finally, from our point of view, the most important distinctions of each species are the bio-ecologo-geographical. Evidently, they exist between M. italica and M. ambigua, but have not now been adequately revealed. M. ambigua beyond doubt is a summer species with developmental maximum during

the warm time of the year when the water is well warmed, and the daylight hours are longer. The ecology of M. italica is unclear. From literature data (see Skabichevskiy, 1960: 136, for the compilation), its vegetative time occurs both in the summer and in the spring-autumn periods. But it is possible that in some cases the species has become confused with M. ambigua. According to unquestionably reliable data of K. A. Gusevan and L. I. Il'inskiy (1959), M. italica develops in the Rybinskoye Reservoir in spring under ice and does so in large numbers.

The regions in which both species are distributed are broad, are alongside each other, but do not entirely coincide. Thus, in the Western Siberian depression M. italica has not been reliably found, while M. ambigua is encountered here extensively in both rivers and certain lakes. M. ambigua is quite common in the northern reaches of the European part of the USSR and at the same time is indicated for the Dnepr River. I discovered a typical M. ambigua f. ambigua in materials on the Dunay River plankton, representing the bulk of the plankton in the lower reaches of the river in October. Further investigations must revise the details of the distribution of both species.

Thus far few intraspecies taxons have been described for M. ambigua, but evidently they have not yet all been uncovered. Recently, in an investigation of plankton samples from high-mountain Altay lakes given me by S. N. Ulomskiy, an unquestioned M. ambigua was found in a sample from Lake Verkhniy Sundiuk (August 1960, water temperature 12°), but still differing from its available descriptions. I placed it in a special form, whose description is given below.

Melosira ambigua (Grun.) O. Mull. f. altaica Skabitsch. f. nov. (Bacillariophyta, Coscinodiscaceae Kutz.).

Cellulae breviter cylindricae fila brevia formantes. Sulcus et pseudosulcus speciei. Structura faciei lateralis valvulae robusta. Dimensiones cellularum: 6-17 microns in diam. altitudo valvulae 3.5-9 microns, Series pororum 13-17 pro 10 microns, pori 13-17 in serie. (Vide figuram; 6-8).

Typus. URSS: Rossia, Regio Altaica, lacus altimontanus Sundruk Verchny in plancto, 20 VIII 1960, S. N. Ulomsky; in cath. biol. Inst. Medicin. opp. Omsk conservatur.

A. M. ambigua f. ambigua structura valvulae robusta, numero serierum pororum et pororum in serie, nec non altitudine valvularum minore distinguitur.

The cells are short-cylindrical, with flat disks, 6-17 microns in diameter, tightly connected to each other and forming short filaments. The cellular and intercellular annular grooves are the same as in the species. The valves are 3.5-9 microns in height. The structure of the lateral surface of the valves as in the case of the species consists of pairs arranged in spiral or oblique rows, 13-17 rows of 10 microns and 13-17 pairs of 10 microns. Tiny denticles lying the margin of the disk. (See figures, 6-8).

Type. RSFSR, Altay Kray, high-mountain Lake Verkhniy Sundruk, 20 August 1960, S. N. Ulomskiy. Stored in the biology department of the Omsk Medical Institute.

F. altaica has all the features characteristic of M. ambigua and, which is particularly important, has a broad cellular groove with rounded bottom, but differs from M. ambigua by the coarser structure of the valve, by the more infrequent arrangement of rows of pores, and of pores in each row (they are 16-24 rows of pores in M. ambigua f. ambigua, and 18-20 pores per row of 10 microns) and by the lower valve height (the valve height is 3.5-15 microns for M. ambigua f. ambigua). Based on all these features, f. altaica

does not differ sharply from f. ambigua, but these features are so substantial that they give this form a distinct appearance. At first glance it resembles M. distans by its lower valve height, and only after careful inspection of the groove and the valve structure does become clear that it does not belong to the group of forms of this latter species. The distinctness of the habitat conditions determined by the array of factors intrinsic to high-mountain bodies of water allows us to presuppose more essential points of difference of the Altay form from f. ambigua and to regard as a subspecies, but for a final judgment we need additional information on the distribution of this organism. Growing auxospores containing up to 8 cells, 15 microns in diameter, were also encountered in the plankton sample.

Juvenile valves with "italica"-shaped annular groove could be seen among the typical cells in the f. altaica filaments (see figure, 6).

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